descriptive text on the drawings. Particularly, Applicants have included many of the claimed inventive features of the golf ball and its components. The addition of text to the drawings is believed to remedy the Examiner's concerns.

III. Rejection Under 35 U.S.C. § 112, ¶ 2 Has Been Remedied

Claims 1-44 were initially rejected under 35 U.S.C. § 112, second paragraph. In accordance with the Examiner's request, Applicants have included various aspects of the claimed process and golf balls on the drawings. Some of the claimed features have not been noted on the drawings since Applicants believe that it would be awkward and cumbersome to do so. For instance, it would be unwieldy to note all claimed materials for each of the various components of the claimed process. However, if the Examiner wishes for such materials, or other features of the claimed invention to be noted on the drawings, Applicants ask the Examiner to so indicate.

On page 3 of the Office Action, the Examiner stated that "[b]ase claim 14 is inconsistent with the ionomer recited in claim 35." Base claim 14 permits the core, mantle layer, or cover layer to be reaction injection molded with polyurethane/polyurea. Claim 35 points out a particular embodiment, namely that the cover of such a golf ball construction could be an ionomer, and thereby defining the particular layers that can be reaction injection molded. For instance, prophetic examples 2, 3 and 5 describe ionomer cover materials where the core has been reaction injection molded. Thus, Applicants respectfully disagree with the Examiner's assertion that base claim 14 is inconsistent with the ionomer recited in claim 35.

Applicants have amended claim 39 so that it depends on claim 38, not claim 36. Applicants have also amended claim 42 to remove any confusion as to whether it is a process or product claim. Applicants appreciate the careful and thoughtful review of the Examiner.

IV. Rejection Under 35 U.S.C. § 103 Has Been Overcome

Claims 1-44 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Melvin* or *Cavallaro*, each in view of *Molitor*. Specifically, the Examiner stated in the Office Action at page 3, paragraph 4:

> The latter reference [*Molitor*] renders it obvious to mold the polyurethane layers of the primary reference golf balls [*Melvin* or *Cavallaro*] by a reaction injection molding process, since such is an obvious expedient for providing the desired resiliency in a golf ball, as illustrated by the secondary reference [*Molitor*]. Any other possible distinctions over said thus modified golf balls are deemed conventional molding techniques that would necessarily be used in such molding process.

A. The Present Application

The present application claims a process of making a multi-layered golf ball where at least one layer is a fast-chemical-reaction-produced component formed by mixing two or more reactants during the molding process. The reaction time is about 5 minutes or less, and preferably 3 minutes or less. The component comprises at least one member of the group consisting of polyurethanes, polyureas, epoxies and unsaturated polyesters, and preferably polyurethane and polyurea. The thickness of the component is at least 0.01 inches, and preferably at least 0.02 inches. The flex modulus for the component is between about 5 kpsi to about 310 kpsi, and preferably 5-100 kpsi.

The preferred process of creating such a component is by reaction injection molding (RIM). RIM is a process where highly reactive liquids are injected into a closed mold, mixed in an in-line device, and polymerized in the mold to form a coherent, one-piece molded article. A multi-piece ball comprising RIM material including polyurethane/polyurea is formed by the RIM process. The process producing the golf ball includes the step of reaction injection molding the polyurethane/polyurea material to form at least one of a core layer and cover layer of the ball. Specifically, the process for producing a golf ball comprises (a) forming a core; (b) covering the core; and (c) coating and adding indicia to the covered ball, wherein at least one of steps (a) and (b) comprises RIM of polyurethane/polyurea material.

The process may include the step of recycling at least a portion of the reaction product, preferably by glycolysis. 5-100% of the polyurethane/polyurea formed from the reactants used to form particular components is obtained from recycled polyurethane/polyurea.

The fast-chemical-reaction-produced component can be either a layer within the core or cover, or more than one component of either the core or cover. The component or components produced from the fast-chemical-reaction process has a flex

modulus of 5-310 kpsi, a reaction time of 5 minutes or less, and a thickness of at least 0.01 inches.

B. The Pending Claims Are Nonobvious In View of the Cited Art

For the reasons set forth below, it would not be obvious to manufacture the golf balls or use the process claimed in the present application by examining the golf balls disclosed in the primary references of *Melvin* and *Cavallaro* and understanding that those golf balls may be manufactured by a process disclosed in the secondary reference *Molitor*.

Molitor teaches the use of the RIM process in conjunction with the manufacture of golf club heads. *Molitor* neither teaches the RIM process for manufacturing golf balls, nor discloses its advantages. Further, *Molitor* does not disclose that the process for manufacturing golf club heads could also be used for golf balls.

At the same time, primary references *Melvin* and *Cavallaro* do not disclose that the manufacturing methods used for golf clubs could also be used for golf balls. Instead, the primary references would lead a skilled artisan to avoid utilizing processes taught outside of golf balls. For example, *Cavallaro* discloses that the molding process used "can be made by any conventional process employed in the golf ball art (col. 14, lines 37-38)." Therefore, it would not be obvious based upon reading the primary references that using the RIM process for the manufacture of club heads can also be used for golf balls. If anything, the primary references would steer a skilled artisan away from using golf club manufacturing techniques for golf balls.

Moreover, the RIM process used in forming components of a multi-layered golf ball disclosed in the present application is substantially different from, and advantageous over, the conventional injection and compression molding techniques taught in *Melvin* and *Cavallaro*.

First, during the RIM process of the present application, the chemical reaction, *i.e.*, the mixture of isocyanate from the isocyanate tank and polyol from the polyol tank, occurs during the molding process. Specifically, the mixing of the reactants occurs in the recirculation mix head and the after mixer, both of which are connected directly to the injection mold. The reactants are simultaneously mixed and injected into the mold, forming the desired component.

On the other hand, *Melvin* and *Cavallaro* teach the mixing of reactants to occur before the molding process. Mixing under either compression or injection molding occurs in a mixer, such as a Banbury mixer (*Melvin*, col. 9, line 50), that is not connected to the molding apparatus. Thus, the reactants must first be mixed in a mixer separate from the molding apparatus, then added into the apparatus. Such a process causes the mixed reactants to first solidify, then later melt in order to properly mold.

Second, the RIM process requires lower temperatures and pressures during molding than does injection or compression molding. Under the RIM process, the molding temperature is maintained at about 100-120°F in order to ensure proper injection viscosity. Compression molding is completed at a higher molding temperature of 320°F (160°C) (*Cavallaro*, col. 8, line 38). Injection molding is completed at even a higher temperature range of 392-482°F (200-250°C) (*Melvin*, col. 10, line 26). Molding at a lower temperature is beneficial when, for example, the cover is molded over a very soft core so that the very soft core does not melt or decompose during the molding process.

Third, the RIM process creates more favorable durability properties in a golf ball than does conventional injection or compression molding. The present application provides improved durability for a golf ball cover by providing a uniform or "seamless" cover in which the properties of the cover material in the region along the parting line are generally the same as the properties of the cover material at other locations on the cover, including at the poles. The improvement in durability is due to the fact that the reaction mixture is distributed uniformly into a closed mold. This uniform distribution of the injected materials eliminates knit-lines and other molding deficiencies which can be caused by temperature difference and/or reaction difference in the injected materials. The RIM process of the present application results in generally uniform molecular structure, density and stress distribution as compared to conventional injection molding processes, where failure along the parting line or seam of the mold can occur because the interfacial region is intrinsically different from the remainder of the cover layer and, thus, can be weaker or more stressed.

Fourth, the RIM process is relatively faster than the conventional injection and compression molding techniques. In the RIM process, the chemical reaction takes place in under 5 minutes, typically in less than two minutes, preferably in under one

minute and, in many cases, in about 30 seconds or less. The demolding time of the present application is 10 minutes or less. The molding process alone for the conventional methods disclosed in *Melvin* and *Cavallaro* typically take about 15 minutes (*Cavallaro*, col. 8, line 38). Thus, the overall speed of the RIM process makes it advantageous over the injection and compression molding methods.

Independent claim 1 recites process for making a cover or core component of the golf ball by mixing two or more reactants that form a reaction product in five minutes or less with a demold time of 10 minutes or less. Independent claims 38 and 40 recite processes for producing a golf ball including the step of reaction injection molding polyurethane/polyurea material to form at least one core or cover layer of the ball. None of these claimed processes, nor the advantages of using such processes as described above, are taught or described in the references cited by the Examiner.

Specifically, independent claim 1 calls for the formation of at least one core or cover component to be formed by mixing two or more reactants that react and form a reaction product in a reaction time of less than 5 minutes with a demolding time of less than 10 minutes. As disclosed above, the cited references fail to disclose or teach a process in which two or more reactants are mixed and simultaneously molded into the particular golf ball component. Instead, the cited references teach a reaction that forms a product, solidifies, and in turn must later be melted into the desired component. This, however, is not the process that is claimed in claim 1 of the present application.

Accordingly, claims 2-13 are all dependent from claim 1, and so contain all of its recited aspects. Furthermore, these claims call for particular features such as component thickness, Shore D hardness, and particular reactants used in the present process which, in combination with independent claim 1, are neither disclosed nor taught in the cited references.

Independent claim 38 recites a process for producing a golf ball including the step of reaction injection molding a polyurethane/polyurea material to form at least one of a core layer and a cover layer of the ball. The cited references of the Examiner do not set forth the reaction injection molding process for golf balls. As stated above, *Melvin* and *Cavallaro* would steer a person skilled in the art away from *Molitor* because *Melvin* and *Cavallaro* disclose using methods of forming golf balls known in the golf ball art. *Melvin* and *Cavallaro* merely teach the use of other commonly used processes in

forming golf ball components such as compression molding and injection molding. However, as already discussed above, these two molding methods are quite different from reaction injection molding in that the reaction product solidifies and must later be melted when forming the golf ball component. Thus, the cited references clearly neither describe nor teach the recitations of claim 38.

Dependent claim 39 depends upon independent claim 38, and thus, contains all of the recitations of claim 38. Also, claim 39 further claims features which are not taught by the cited references, such as recycling at least 20% of the polyurethane/polyurea produced but not incorporated into the ball. Thus, the cited references neither disclose nor teach the claimed features of claims 38 and 39.

Independent claim 40 recites a process for producing a golf ball comprising (a) forming a core, (b) covering the core, and (c) coating and adding indicia to the covered ball, where at least one of the steps (a) and (b) comprises reaction injection molding of a polyurethane/polyurea material. Again, none of the cited references teach or disclose reaction injection molding for golf balls as recited in independent claim 40. Further, none of the cited references teach the use of polyurethane/polyurea material for use with reaction injection molding for golf balls as also claimed in independent claim 40. Thus, independent claim 40 cannot be obvious in light of the cited references.

Moreover, dependent claim 41 is dependent from claim 40 and so contains all of its recited aspects. Dependent claim 41 also recites the recycling of at least 20% of the RIM-produced material produced consequent to step (a) which is a step that is not in itself recited in the cited references with respect to golf balls.

Independent claims 14, 42, and 44 all recite particular golf balls. The cited references, either alone or in combination, fail to disclose or teach the golf balls of these claims.

Claim 14 recites a multi-piece golf ball comprising a reaction injection molded material comprising polyurethane/polyurea. Again, none of the cited references disclose or teach reaction injection molding material used in accordance with a multi-piece golf ball. Moreover, none of the cited references, either alone or in combination, teach or disclose the use of polyurethane/polyurea as the reaction injection molded material used in a multi-piece golf ball. Therefore, the golf ball claimed in independent claim 14 is neither disclosed nor taught by the cited references.

Furthermore, dependent claims 15-37, which are dependent or ultimately dependent from independent claim 14, also recite the features set forth in claim 14, and thus, are neither disclosed nor taught by the Examiner's cited references. Dependent claims 15-37 recite features in combination with claim 14 which are neither disclosed nor taught in the cited references. For example, claim 15 recites that the golf ball comprises a reaction injection molded material comprising polyurethane/polyurea including at least one of ether functional groups and ester functional groups. None of the references cited by the Examiner discloses or teaches a golf ball comprised of a reaction injection molded material, let alone a golf ball with a reaction injection molded material comprising polyurethane/polyurea and including at least one of ether functional groups and ester functional groups. Just as with dependent claim 15, the cited references neither disclose nor teach, alone or in combination, the recited features of dependent claims 16-37.

Independent claim 42 recites a golf ball comprising at least one fast-chemical reaction-produced layer having a flex modulus of 5-310 kpsi in a reaction time of 5 minutes or less and a thickness of at least 0.01". None of the cited references disclose or teach a fast-chemical-reaction-produced layer for a golf ball. Moreover, none of the cited references disclose or teach the claimed features such as a flex modulus of 5-310 kpsi, a reaction time of 5 minutes or less and a thickness of at least 0.01" for a fast-chemical-reaction-produced layer for a golf ball. Thus, independent claim 42 is not obvious in light of the cited references since the references neither disclose nor teach, alone or in combination, the claimed features.

Moreover, dependent claim 43, which depends upon claim 42 and contains all of its recited aspects, is neither disclosed nor taught in the cited references. Dependent claim 43 recites that the golf ball of claim 42 has a multi-layer cover and at least one fast-chemical-reaction-produced layer is an inner cover layer. Again, the cited references neither disclose nor teach *any* golf ball layer to be fast-chemical-reaction-produced, let alone an inner cover layer. Therefore, none of the cited references disclose or teach the claimed features recited in dependent claim 43.

Independent claim 44 recites a golf ball having a core and a cover with the cover comprising a polyurethane/polyurea which is formed from reactants, 5-100 weight percent of which are obtained from recycled polyurethane/polyurea. The cited references neither disclose nor teach a golf ball cover comprising

polyurethane/polyurea, 5-100 weight percent of which is obtained from recycled polyurethane/polyurea. Therefore, the claimed features of claim 44 are neither disclosed nor taught in the cited references.

Withdrawal of the rejection under 35 U.S.C. § 103(a) is respectfully requested.

IV. CONCLUSION

In view of the above comments, it is believed that this application is in condition for allowance. Therefore, the Applicants respectfully request favorable reconsideration and allowance of this application.

Respectfully submitted,

FAY, SHARPE, FAGAN,
MINNICH & McKEE, LLP

Richard M. Klein
Reg. No. 33,000
Mark E. Bandy
Reg. No. 35,788
1100 Superior Avenue, Seventh Flr.
Cleveland, OH 44114-2518
(216) 861-5582

CERTIFICATE OF MAILING

I hereby certify that this **AMENDMENT AND RESPONSE UNDER 37 C.F.R. 1.115** in connection with U.S. Patent Application Serial No. **09/040,798** is being deposited with the United States Postal Service as first class mail in an envelope addressed to the Assistant Commissioner for Patents, Box NON-FEE AMENDMENT, Washington, D.C. 20231 on September 8, 1999.

Mary Ann Tomeavari

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